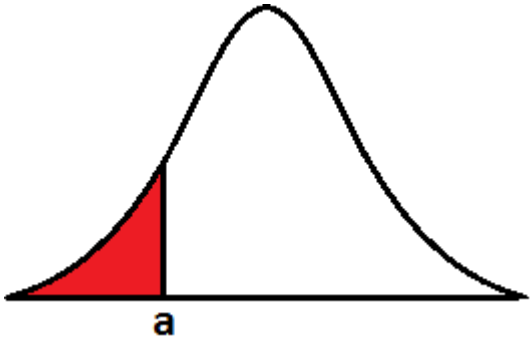
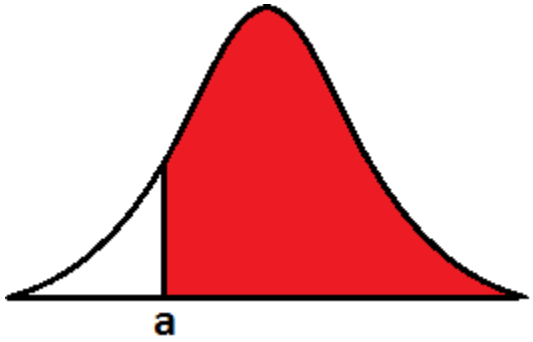
Finding Probability/Proportion/Area Under Curve for Normally Distributed Data

1. **Determine which portion of the graph is being used (DRAW A PICTURE!!!)**
2. **Find Z-Score that corresponds to your data value (x)**
3. **Use a distribution table or calculator to find the relevant area**

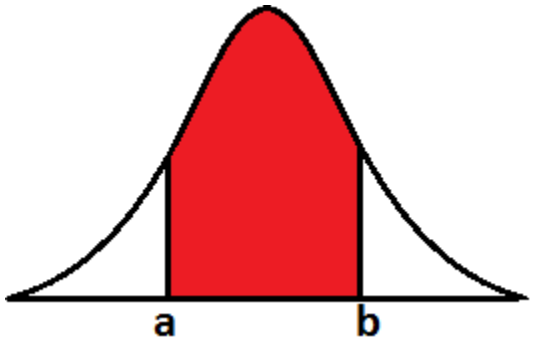
If you are looking for…

AREA TO THE LEFT OF THE X-VALUE	**AREA TO THE RIGHT OF THE X-VALUE**
The graph will look like this: 	**The graph will look like this:** 
Common expressions used to describe it: - **P(X < a)** - **No more than a** - **At most a** - **Less (or fewer) than a** - **R percentile**	**Common expressions used to describe it:** - **P(X > a)** - **No less than a** - **At least a** - **More (or greater) than a** - **Area corresponding to $Z_{area(\%)}$**
Method of Solving: **1. Convert your a value to a z-score:** $$z_a = \frac{a - \mu}{\sigma}$$ **2. To find area look up z-score on distribution table** **Or with graphing calculator:** **2nd VARS**  **normalcdf(-100, Z_a)**	**Method of Solving:** **1. Convert your a value to a z-score:** $$z_a = \frac{a - \mu}{\sigma}$$ **2. To find area look up z-score on distribution table** **3. Subtract corresponding area from 1:** **Area to right = 1 – Area to left** **Or with graphing calculator:** **2nd VARS**  **normalcdf(Z_a, 100)**

If you are looking for…

AREA BETWEEN TWO VALUES

The graph will look like this:



Common expressions used to describe it:

- **P(X > a AND X < b)**
- **Between a and b**
- **"within acceptable range"**
- **"items to be kept"**
- **Middle R % (z_a will be the opposite of z_b)**

Method of Solving:

1. **Convert your a and b values to z-scores:**

$$z_a = \frac{a-\mu}{\sigma} \qquad z_b = \frac{b-\mu}{\sigma}$$

2. **Look up z-scores on distribution table**

3. **Subtract area for z_a from area for z_b:**

Area between a and b = Area to left of b – Area to left of a

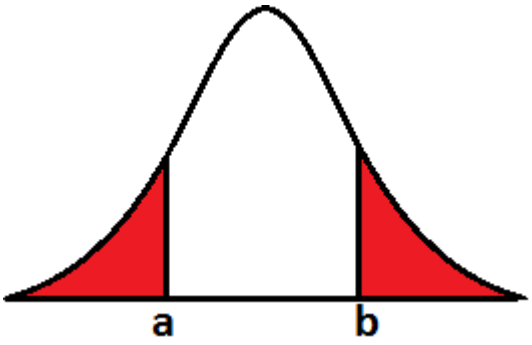
Or with graphing calculator:

2nd VARS

normalcdf(Z_a, Z_b)

AREA OUTSIDE OF TWO VALUES

The graph will look like this:



Common expressions used to describe it:

- **P(X < a OR X > b)**
- **Less than a or greater than b**
- **"outside acceptable range"**
- **"items to be discarded"**

Method of Solving:

1. **Convert your a and b values to z-scores:**

$$z_a = \frac{a-\mu}{\sigma} \qquad z_b = \frac{b-\mu}{\sigma}$$

2. **Look up z-scores on distribution table**

3. **Find area to the right of b:**
   Area to right = 1 – area to left

4. **Add area to left of a and area to right of b**

Or with graphing calculator:

2nd VARS

normalcdf(-100, Z_a)

2nd VARS

normalcdf(Z_b, 100)

Area= normalcdf(-100, Z_a) + normalcdf(Z_b, 100)